

# Proper Lifting, Pushing and Pulling to Prevent Strains, Sprains and Lower Back Pain

## **INFORMATION BELOW DERIVED FROM THE FOLLOWING:**

William J. Becker, Safety Consultant, University of Florida  
National Institute of Occupational Safety and Health

According to the National Institute for Occupational Safety and Health (NIOSH), the most common type of non-fatal occupational health injuries involving lost-work days are sprains, strains and tears. This category of injury resulted in 799,000 cases in 1997 (latest available data). Of those incidents, half of the cases (385,000) were back injuries, accounting for about 80% of all traumatic back injuries and disorders.

Overexertion is the most common cause of sprains, strains and tears, accounting for over 50% of all cases. It is also the most costly type of injury. The price tag for injuries caused by overexertion cost employers \$9.8 billion in wage replacement and medical payments in 1998, according to a recently published report by Liberty Mutual. This amount represents about 25.57% of the total estimated workers' compensation costs nationwide.

In addition, 50% of the workforce experience some type of back pain each year, from mild to severe. Those employees who miss work due to more serious back injuries are away from work for an average of three months.

Given these statistics, an increasing number of occupational health and safety managers are placing greater emphasis on back injury prevention programs. Following is a general guideline for avoiding back injuries in the workplace.

### **Overexertion-The Leading Cause of Back Injuries**

Overexertion injuries are the result of excessive lifting, pushing, pulling, holding, carrying or throwing an object. These injuries, which involve the nerve, tendons, muscles and supporting structures of the body are considered musculoskeletal disorders (MSDs).

### **Risk Factors**

NIOSH conducted a review of evidence to examine the relationship between selected MSDs of the upper extremity and low back, and exposure to physical factors at work.

The review established strong evidence that low-back disorders are associated with work-related lifting and forceful movements. The review also cited strong evidence of a causal relationship between low-back disorder and whole body vibration (WBV), which occurs when mechanical energy oscillations are transferred to the body as a whole. Typical exposures for WBV include driving automobiles, trucks and operating industrial vehicles. Other physical workplace factors found to have an association with back disorders include awkward posture and heavy physical work, although these risk estimates are more moderate than lifting and forceful movements. MSDs risk factors include intensity, frequency and duration of the physical exposure. MSDs are also affected by individual factors, such as age, physical condition, sociocultural and psychosocial variables.

### **Injuries Segmented by Occupation and Industries**

Almost a third of non-fatal, occupational MSDs injuries that involve lost workdays, occur in the service sector, with the manufacturing industry falling closing behind at 21%. Most of these injuries were experienced by operators, fabricators and laborers, comprising 42% of all cases in 1997.

### **Type of Injuries**

Back strain occurs when the muscle, ligaments and/or tendons in the back are damaged due to overstretching or overuse of the muscles in the back. These injuries result in strains, sprains and tears. Herniated disks are also a type of back injury found in workplace situations.

The most common causes of low-back pain are:

- Improper and/or excessive methods of lifting, pulling, pushing, carrying, holding, carrying or throwing an object (overexertion)
- Lowering, Bending or twisting
- Sudden slip or fall
- Cumulative trauma-multiple micro-injuries sustained over a period of time

## **Components for Designing an Effective Back Safety Program**

To avoid workplace back injury, NIOSH recommends the implementation of an ergonomics program that focuses on redesign of the work environment and work tasks to reduce the hazards of lifting.

There are a number of proven ergonomic program components that can minimize back injuries on the job. These components include:

- Training in proper lifting techniques
- Physical conditioning and stretching
- Reduction in size of objects or material being moved
- Adjusting the height at which the object or materials are retrieved or deposited
- Implementing mechanical aids, such as hoists or adjusted lift tables to reduce the need to bend, reach and twist
- Evaluation of production, storage and display workflows to remove excessive reaching, bending, pushing, pulling, lifting loading and unloading

## **Prevention Of Lifting, Pushing And Pulling Injuries**

There are two methods for reducing sprains and strains in the workplace: design and work practice modification.

### **Design Modification**

By redesigning the workplace it might be possible to eliminate the lifting, pushing and pulling entirely by mechanical means. Examples: Use forklifts to move items, self-propelled or riding lawn mowers do not require pushing, and mechanical power to eliminate some pulling activities.

Another design modification would be to change the size, shape and weight of the container. This has been done in many areas. Example: Feed, seed and fertilizer bags in the 80 or 100 pound sizes are no longer common. Nevertheless, many objects are still difficult to handle. Easier, safer methods of moving or lifting materials should constantly be sought.

Work stations, for workers who spend long hours in a standing or seated position, must be designed to reduce stress to the back and legs. A cushioned floor, a low footrest to enable workers to raise and lower their legs, and a work table of proper height are all important.

Seated workers should be at a height comfortable for their work. Their knees should be slightly higher than their hips, and a footrest should be provided. The seat should provide support for the lower back. Finally, the work should be arranged to minimize stooping, excessive reaching and twisting at the waist.

### **Work Practice Modifications**

Workers can modify their work practices in the following ways:

- **Lift objects comfortably, not necessarily the quickest or easiest way.**
- **Lift, push, and pull with your legs, not your arms or back.**
- **When changing direction while moving an object, turn with your feet, not by twisting at the waist.**
- **Avoid lifting higher than your shoulder height. Use a step stool or ladder to move objects at these heights.**
- **When sitting, sit with your knees slightly higher than your hips, with a firm backrest for your lower back. Move, cross and uncross your legs frequently.**
- **Sit in a vehicle as you sit in a chair, with your knees slightly above your hips, with support for your lower back.**
- **When standing while working, stand straight. Avoid bending at your waist. For prolonged standing, use a low footstool for alternate resting of your legs and for altering your stance. Wear comfortable, supportive shoes.**
- **When walking, maintain an erect posture, wear slip-resistant, supportive shoes. The majority of slips, trips and falls can be prevented by wearing quality work shoes with slip-resistant heels and soles.**
- **When carrying heavy objects, carry them close to the body and avoid carrying them in one hand.**
- **When heavy or bulky objects need to be moved, obtain help or use a mechanical aid such as a dolly, hand truck, forklift, etc.**
- **When stepping down from a height of more than eight inches, step down backwards, not forward.**

## **Lifting Theories And Techniques**

There are numerous lifting theories and techniques, of which the "straight-back, lift-with-your- legs approach", is the most common and most frequently promoted. But after decades of promotion and training this approach to lifting has not been widely accepted by workers, and there is little or no evidence that it has reduced the number or severity of injuries.

In more recent years, numerous other theories and techniques have been promoted, criticized and discarded. There are hip flexing, kinetic-lifting, stooped-posture and pelvic-tilt techniques, among others, which all have both positive and negative considerations. Presently, however, there is no "one-best" lifting method for all lifts, for all people.

Basically, there are seven rules for safe lifting that have been developed over the years. Some of these are similar to rules of the past; others are new and different. They are presented below:

1. **Lift Comfortably.** Choose the position that feels best, with or without a straight back.
2. **Avoid Unnecessary Bending.** Do not place objects on the floor if they must be picked up again later.
3. **Avoid Unnecessary Twisting.** Turn your feet, not your hips or shoulders. Leave enough room to shift your feet so as not to have to twist.
4. **Avoid Reaching Out.** Handle heavy objects close to the body. Avoid a long reach to pick up an object.
5. **Avoid Excessive Weights.** If the load is too heavy, get help or use a mechanical device, if possible.
6. **Lift Gradually.** Lift slowly, smoothly and without jerking.
7. **Keep in Good Physical Shape.** Get proper exercise and maintain a good diet.

## At-Home Modifications

Sprains, strains and lower back pain on the job can be partially caused by what you do or do not do at home. Below are some recommendations to follow.

- **Maintain a reasonable weight, eat nutritious meals, and exercise to maintain well-conditioned muscles.**
- **Sleep on a firm mattress and avoid sleeping on your stomach. When sleeping on your side or back, bend your knees. Place a pillow under your head, another between or beneath your knees.**
- **When you awake, remember that your muscles are still at rest. Gradually stretch your leg, arm, back and stomach muscles before you get up. Do some more stretching exercises after you are out of bed. Some exercises for your consideration are provided in the section entitled, "Treatment of Lifting, Pushing, and Pulling Injuries." Early morning is the recommended time for these exercises, but any time of the day is all right. More important than the time of day is the development of a regular exercise program. This is particularly important for individuals who do limited physical work, but a regular exercise program is also valuable for individuals who are involved in heavy physical labor.**

## Think Before You Lift

There is one final important rule: "THINK BEFORE YOU LIFT". It is better for workers to use their own common sense than to teach them specific lifting, pushing, pulling, walking, climbing or jumping procedures. This is not to imply that unsafe behaviors should not be pointed out to others and corrected. For example, "common sense" may tell certain people to jump down from heights of several feet. Certainly, when people exhibit this type of behavior or when they attempt to carry two hundred pounds, the errors of their behavior should be brought to their attention. Remember, you are the major cause of your injuries; therefore, you have the major responsibility for preventing them.

## Exercises To Improve Your Physical Condition

There are many exercises to strengthen and increase the flexibility of important muscle groups, particularly in your back, abdomen and legs. These exercises are NOT designed to increase endurance, strengthen your heart or improve circulation. To accomplish such goals, aerobic-type exercises such as fast-paced walking, jogging, running, dancing or swimming are required.

The following exercises ARE designed to increase flexibility and strengthen and condition your muscles. They need not be exhausting.

**HOWEVER, AS WITH ANY EXERCISE PROGRAM, IT IS RECOMMENDED THAT THESE EXERCISES BE CONDUCTED WITH THE APPROVAL OF YOUR PHYSICIAN. IF ANY PAIN DEVELOPS AND PERSISTS, MEDICAL ATTENTION SHOULD BE SOUGHT IMMEDIATELY.**

**Pelvic Tilt**

**Knee to Chest Raise**

**SINGLE LEG RAISE**

**HALF SIT-UP**

**STRAIGHT BACK BEND**

**HAMSTRING STRETCH**

**OVERALL CONDITIONING BACK EXTENSION**

**LOWER BACK FLEXION**

**BACK REST**

**PELVIC TILT (2):** Lie on your back with knees bent and your forearms behind your head. Keep your back down. Firmly tighten your buttock muscles, hold for five seconds and relax. Repeat this exercise five times.

**KNEE-TO-CHEST RAISE (3):** Again, lie on your back with knees bent, your forearms behind your head. Raise your right knee to your chest, hold for five seconds, and return the leg to the starting position. Repeat the exercise five times with each leg. Then repeat the exercise five times raising both legs at the same time.

**SINGLE LEG RAISE (4):** Assume the same position, on your back, knees bent and forearms behind your head. Slowly raise one leg while straightening it out, then raise it as far as possible. Hold for five seconds and slowly return the leg to the starting position. Repeat the exercise five times with each leg.

**HALF SIT-UP (5):** Assume the same position, on your back with knees bent, but with your arms crossed over your chest. Slowly raise your head and neck until your chin touches your chest. Continue raising, stretching your hands to your knees. Hold for five seconds and then slowly return to the starting position. Repeat the exercise five times.

**STRAIGHT BACK BEND (6):** Assume the standing position, feet no more than six inches apart, arms to your side. Bend at the hips and knees until thighs are parallel to the floor. Hold for five seconds, raise to standing position. Repeat the exercise five times.

**HAMSTRING STRETCH:** Sit on the floor, legs straight out in front of you with toes up, heels no more than six inches apart. Bend forward slowly reaching for your toes. Hold forward position for five seconds and slowly return to the starting position. Repeat the exercise five times.

**OVERALL CONDITIONING (7):** If physical activity is not part of your daily routine, regular aerobic exercise should be. Aerobic exercise, such as running, walking or swimming, will help keep your body in condition.

**AGAIN, THESE TYPES OF ACTIVITIES SHOULD BE DONE  
WITH THE APPROVAL OF YOUR PHYSICIAN.**

### **Treatment Of Lifting, Pushing And Pulling Injuries**

Muscle fatigue, cramps and spasms are symptoms that muscles have been overworked. This can lead to the more serious problem of muscle strain or pull. Rest, gentle massage, and the application of cold packs for a short time can be helpful.

If the problem is tension, minor stress, or pain in the back, the following actions may be helpful:

**BACK EXTENSION (8):** Stand in a comfortable position, then place your hands in the lower back area (between your waist and buttocks) and bend backward as far as you can comfortably. Hold this position for one minute. Relax and repeat three or four times.

**LOWER BACK FLEXION (9):** Sit on a straight-back chair and lean forward as far as you can, attempting to rest your chest on your knees. Hold this position for three to five minutes.

**BACK REST (10):** Lie flat on your back placing the lower half of your legs (calves) on a chair, sofa or bed. Stay in this position for fifteen minutes.

There are times to seek medical attention for sprain, strains and lower back pain. These times are listed below.

- When your employer requests that you seek medical attention.
- When the pain/problem does not show significant improvement by the third day.
- When the problem reoccurs with more frequency or severity.
- When the pain radiates/moves to other body locations.
- When a numbness or tingling sensation is felt.
- When respiratory, digestive, or urinary symptoms, or a fever, accompany the pain or problem.
- The first step in the treatment of more serious sprains, strains and back pain is a positive, get-well attitude.

Treatment should be under the direction of competent medical professionals, and will usually include ice therapy treatment, gentle massage, stretching exercises, aspirin to relieve pain and reduce inflammation, and return to light-duty work as soon as possible. Such treatment should result in the vast majority of workers returning to full-duty employment in a minimum amount of time.

Bed rest or immobilization of sprained or strained muscles or joints may relieve the pain, but can result in weakening of the immobilized muscles and significantly increased recovery time.

Obviously, serious muscle, ligament, or back injuries may require more extensive treatment, possibly including surgery and long-term rehabilitation.